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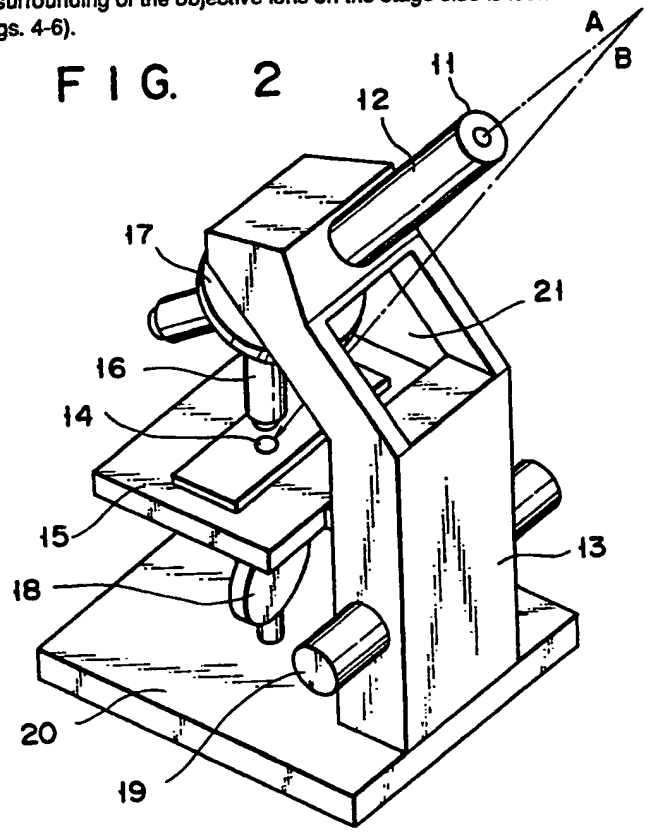
(54) Microscope support arm having an opening or transparent member

(57) A microscope comprises a stage 15 on which a specimen 14 is placed and an arm 13 for supporting the stage so that the stage can be moved away from and/or close to an objective lens 16, and for supporting an ocular lens 11 and the objective lens so that they sandwich the arm. An opening portion 21 is made at a section between a portion of the arm for supporting the stage, and a portion of the arm for suppporting the ocular lens so that an area including the surrounding of the ocular lens and the surrounding of the objective lens on the stage side is looked over. The opening portion 21 may be a transparent member (Figs. 4-6).

FIG. 2



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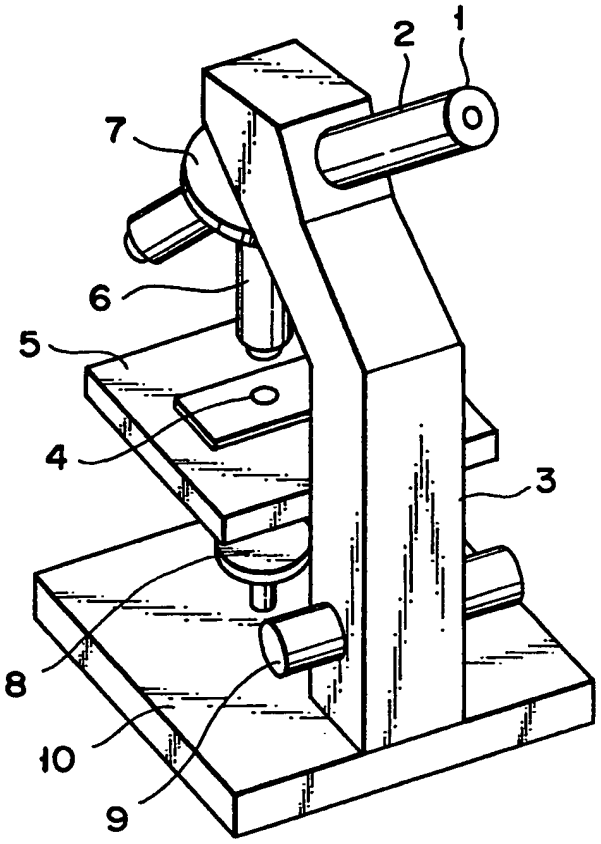

FIG. 1

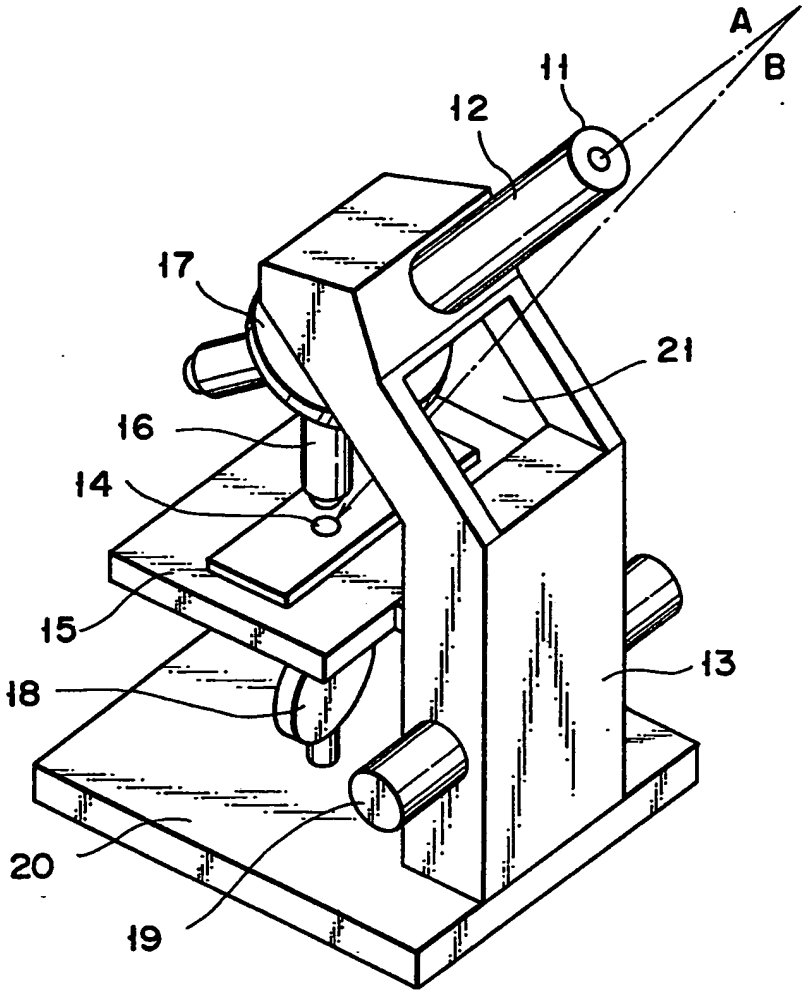

FIG. 2

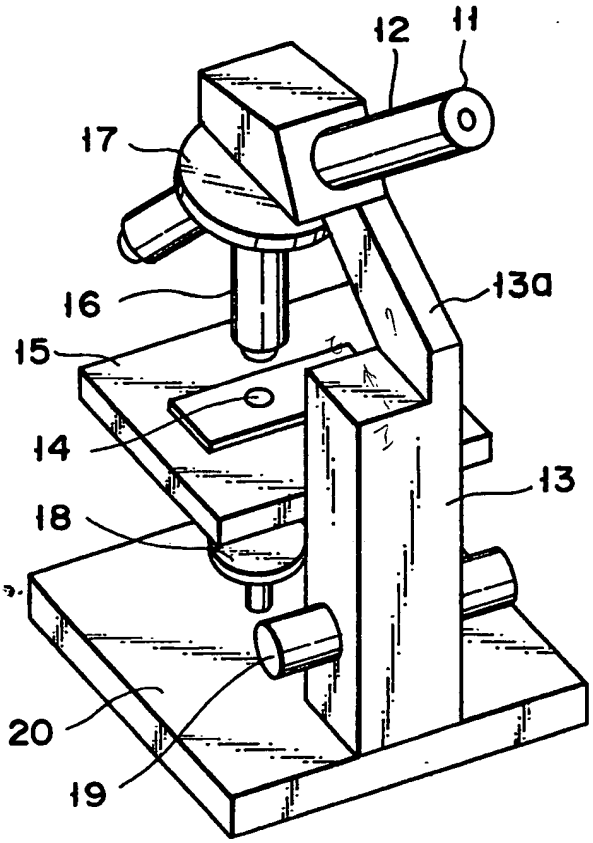

FIG. 3

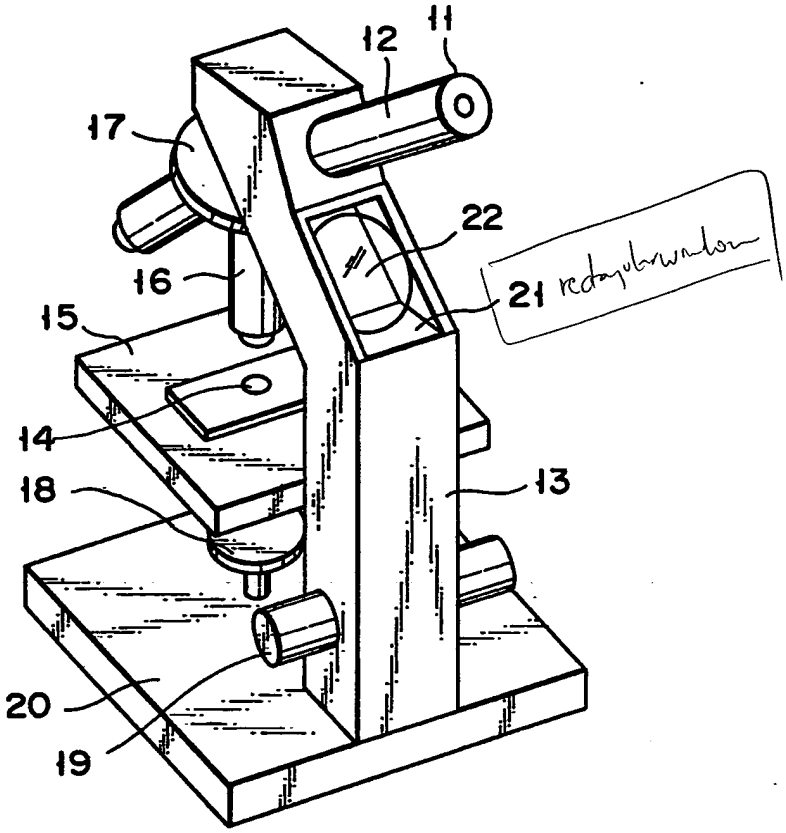

FIG. 4

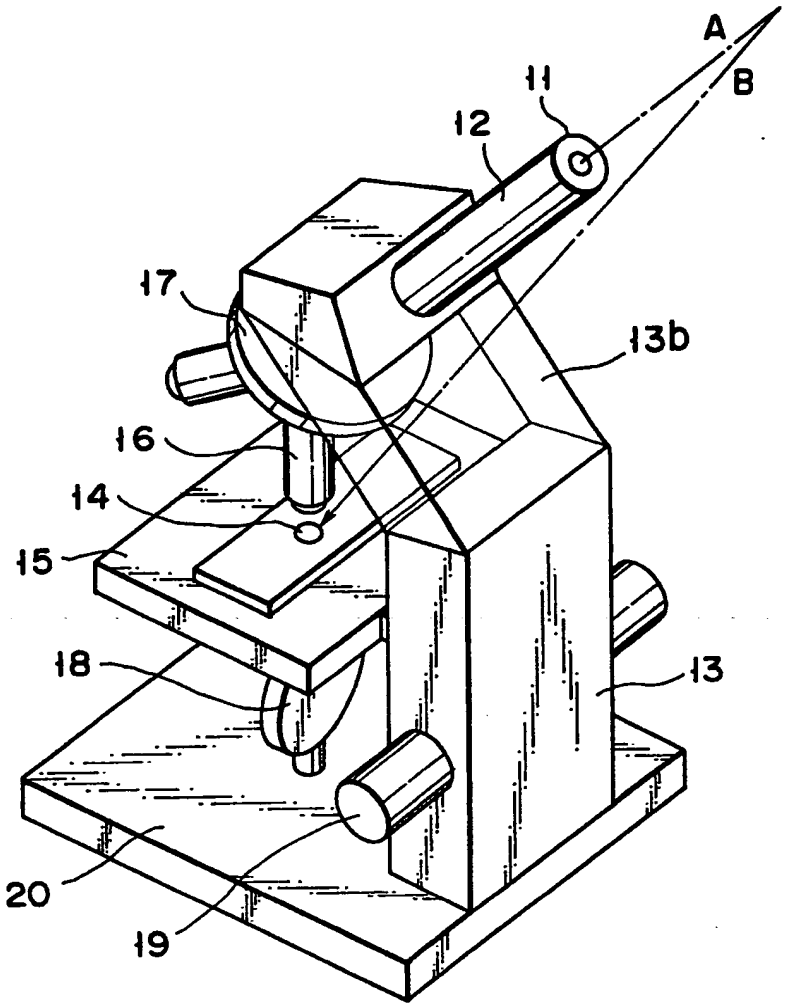

FIG. 5

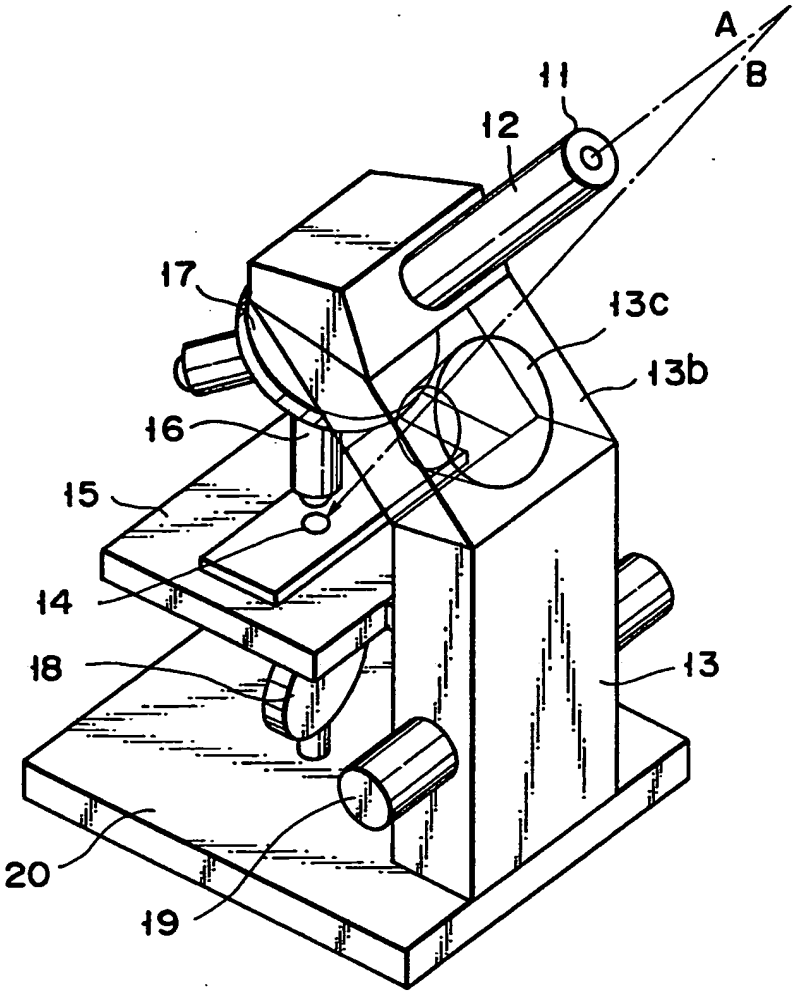

FIG. 6

"MICROSCOPE"

The present invention relates to an optical microscope, and more particularly to a microscope in which an arm supports an ocular lens and an objective lens so that these lenses are extended from the arm in opposite directions.

A typical example of a microscope of this kind will be described, with reference to Fig. 1. A specimen illuminating mirror 8 and a steel casting arm 3 are set up on a base 10. An adjuster 9 is mounted on the arm 3 near the proximal portion thereof, and a stage 5 is horizontally supported at the vertically extended lower portion of the arm 3 which is movable upward and downward. The upper portion of the arm 3 has the same width as the lower portion, and is inclined toward the space above the stage 5. An ocular lens 2 is connected to the outer side of the distal portion of the arm 3 by means of a lens-barrel 2. An objective lens 6 is carried at the inner side or opposite side of the distal portion of the arm 3 by means of a revolving portion 7. The observation optical system of the microscope is composed of the ocular lens 1, the objective lens 6, and a prism provided inside the distal portion of the arm 3.

To observe a specimen 4 with a microscope having the above-stated structure, the specimen 4 is put on a slide glass, which in turn is placed on the stage 5. The stage 5 is moved up and down by rotating the

adjuster 9, adjusting the observation optical system to focus on the specimen 4. Since the microscope does not have safety mechanisms such as an auto-stopper, the objective lens 6 may touch the specimen 4 during adjustment, and the lens 6 and/or the specimen 4 may be damaged. In order to avoid this problem, the focusing must be carried out in the following manner.

First, an observer must look into the ocular lens 1, and make sure that the specimen 4 locates in the visual field of the observation optical system. Then, he moves the objective lens 6 as close as possible to the specimen 4 without touching, as he watches the specimen 4 and the distal portion of the objective lens 6 from a side of the microscope. Again, he looks into the ocular lens 1, and moves the objective lens 6 away from the specimen 4 by rotating the adjuster 9 until the specimen 4 is brought into focus.

In the case of a microscope which requires a procedure similar to the above for focusing on an object, an observer must repeat such a procedure over and over, i.e. to look away once from the ocular lens, and watch the specimen and the surrounding of the objective lens carefully from the side, in order to check the type of lens, the position of the specimen on the slide glass, the relative position between the objective lens and the specimen, and the like. For reducing the trouble of this repeated procedure, it is required that the eye

movements as well as head movements which are carried out to look into the ocular lens and watch the specimen and the surrounding of the distal portion of the objective lens from a side, be minimized. A partial solution to this is to locate the arm which obstruct the observer's view from the surrounding of the ocular lens to the surrounding of the distal portion of the objective lens, to the other side of the stage from the observer's point.

However, with a microscope in which a specimen is lit up from below with the environment light reflected by a mirror, the operator cannot help but intercepting the environment light to reach the mirror. Therefore a quantity of light is inevitably less than that required for observation in many cases for the above-stated reason due to such a structure. For solving this problem of light quantity, a light source must be provided, which causes an increase in the number of parts, as well as production cost.

The object of the present invention is to provide a microscope having a simple structure, with which an observer can look over from the ocular lens to the specimen and the surrounding of the distal portion of the objective lens with minimum eye and head movements.

This invention can be more fully understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a perspective view of a conventional microscope;

Fig. 2 is a perspective view of a microscope according to a first embodiment of the present invention;

Fig. 3 is a perspective view of a microscope according to a second embodiment of the present invention;

Fig. 4 is a perspective view of a microscope according to a third embodiment of the present invention;

Fig. 5 is a perspective view of a microscope according to a fourth embodiment of the present invention; and

Fig. 6 is a perspective view of a microscope according to a fifth embodiment of the present invention.

The following is an explanation of the embodied microscopes according to the present invention. In these embodiments, substantially identical members are denoted by the same reference numerals, and detailed explanation thereof will be omitted.

As shown in Fig. 2, a specimen/illuminating mirror 18 and a steel casing arm 13 are set on the upper surface of a base 20. As known, this mirror 18 is set thereon swingably so that the angle of the mirror can be adjusted. The arm 13 has a lower portion which

arms straight up on the base 20 and an upper portion which is inclined diagonally upward to the front side, and these portions, which are integrated, are made of steel casing. A stage 15 is mounted horizontally to the lower portion of the arm 13 in such a manner that the stage can be moved up and down by rotating an adjuster 19 which is connected to the stage via a known connecting mechanism, not shown in this figure. The upper portion of the arm 13 has the same width as that of the lower portion, and an ocular lens or eyepiece 11 is mounted onto the rear surface of the distal portion thereof via a lens-barrel 12. Further, three objective lenses or objectives 16 having different magnifications are provided on the other side (the rear side) of the distal portion of the arm 13 via a revolving nosepiece 17. The ocular lens 11, objective lens 16, and a prism (not shown) set inside the distal portion of the arm 13 constitute an observation optical system.

Further, an opening portion is made as a rectangular window 21 in the upper portion of the arm 13 adjacent to the lower portion. This window 21 may be made at a portion such that the center of the window locates where an imaginary line (dot-and-dash line B in Fig. 2) drawn between the surrounding of the ocular lens 16 (preferably just below or beside it) and the surrounding of the distal portion of the objective lens 11 (preferably the distal end thereof) hits the arm

13. The rectangular window 21 has a lower horizontal plane and an upper inclined plane. The upper inclined lane is inclined against the horizontal plane at angle of 45° ± 15°. The front face of the window 21 is inclined against the horizontal plane at an angle of 40° ± 5°.

In the case of this embodiment, when an observer has to make sure of the positions, or the like, of the objective lens 16 and the specimen 14, the observer can look over the distal portion of the objective lens and the surrounding of the specimen 14 by looking into the ocular lens with one eye --the line of sight indicated by dot-and-dash line A-- while keeping the line of sight of the other eye to follow the dot-and-dash line B (in the case where the line B passes beside the objective lens), or by setting the lines of sight of both eye on the line B after moving the line of sight of eye looking into the ocular lens therefrom.

Thus, the arm 13 and the window 21 free the observer from moving his head aside, or the like, in order to look over the specimen 14 and the surrounding of the distal portion of the objective lens from the side of the microscope, and enable him to make sure of the position of the specimen and the lens with the minimum eye movement. Further, since the arm 13 is located at the observers's side of the stage, the observer himself does not intercept the environment light which is

to be reflected by the mirror 18, thereby obtaining an amount of light sufficient for observation.

The following is an explanation of the second embodiment of the present invention referring to Fig. 3.

This embodiment differs from the first embodiment in the following respect. That is, the upper portion of the arm 13 is reduced in width as if the left hand side (from the observer's point) thereof is omitted. Thus, the upper observation optical system is supported by a narrow arm 13a which extends from the section closer to the right end. The cross section of the arm is reduced at the point where it becomes inclined, such that, as seen from the microscope user's observation position, there is an open space whereby the user can observe the specimen with his left eye while observing it through the microscope lens with his right eye.

With such a structure, the observer is able to have a view field wider than that of the case of the first embodiment in which window 21 is provided, and therefore visibility of the specimen 14 and the surrounding of the objective lens 16 can be improved.

Fig. 4 shows the third embodiment which differs from the first embodiment in the following respect. That is, in the third embodiment, a convergent lens 12 is fitted into the window 21 shown in Fig. 2.

With such a structure, not only being able to look over the specimen 14 and the surrounding of the

objective lens with the minimum eye movement, but also the section to be watched can be magnified to a certain degree, thereby further improving the visibility thereof.

In the fourth embodiment shown in Fig. 5, the portion of the arm where the imaginary line (dot-and-dash line B in the figure) drawn from the surrounding of the ocular lens 11 to the surrounding of the distal portion of the objective lens 16 crosses with the arm 13, is formed into a transparent member 13b made of, for example, a transparent solid synthetic resin. Thus, a window such as stated in the first embodiment is no longer necessary.

With such a structure, a view field is even wider than those with the second and third embodiments, and the visibility of the specimen 14 and the surrounding of the distal portion of the objective lens 16 can be further improved.

The fifth embodiment shown in Fig. 6 differs from the fourth embodiment in the following respect. That is, a center portion 13c of the transparent member 13b of the arm 13, which is shown in Fig. 5, is formed into a convex lens.

With such a structure, not only being able to have a wider view over the specimen 14 and the surrounding of the objective lens 16, the scene to be looked over can be magnified to a certain degree, thereby the visibility

can be even further improved.

In addition, the present invention cannot be limited to the above-stated embodiments. For example, the shape of the window or through opening hole is not limited to a rectangular including a square, but it may be any other shape such as circular, or elliptic. Further, in the embodiment shown in Fig. 3, the narrow arm 13a supporting the upper optical system which extends out from the section closer to the right end does not have to be closer to the right end. It may be located at the section closer to the left end if it is more convenient for the observer. Moreover, all of the embodiments stated above are monocular, but the advantage of the present invention is not degraded in the case where the invention is applied to a binocular microscope. As long as the main feature of the present invention is not changed, a variety of embodiments can be realized.

Thus, according to the present invention, there is provided an easy-to-operate microscope having a simple structure, with which an operator can look over a specimen and the surrounding of the distal portion of the objective lens with the minimum eye movement without moving the head during operations required in observation such as focusing, positioning, etc.

Claims:

1. In a microscope comprising:

a stage on which a specimen is placed;

an observation optical system having an ocular lens and an objective lens;

an arm for supporting said stage so that the can be moved away from and/or close to the objective lens, and for supporting said observation optical system so that the ocular lens and the objective lens locate as they sandwich the arm; and

a base on which said arm is stood up;

the improvement in which an opening portion is made at a section between a portion of the arm for supporting the stage, and a portion of the arm for supporting the observation optical system so that an area including the surrounding of the ocular lens and the surrounding of the objective lens on the stage side can be looked over.

2. A microscope according to claim 1, wherein said opening portion has a convex lens focused on the surrounding of said objective lens.

3. A microscope according to claim 1, wherein said opening portion includes a through opening passing a light.

4. A microscope according to claim 1, wherein said opening portion is made by omitting either side of the arm.

5. In a microscope comprising:

a stage on which a specimen is placed;

an observation optical system having an ocular lens and an objective lens;

a arm for supporting said stage so that the stage can be moved away from and/or close to the objective lens, and for supporting said observation optical system so that the ocular lens and the objective lens locate as they sandwich the arm; and

a base on which said arm is stood up;

the improvement in which a transparent member is provided at a section between a portion of the arm for supporting the stage, and a portion of the arm for supporting the observation optical system so that an area including the surrounding of the ocular lens and the surrounding of the objective lens on the stage side can be looked over.

6. A microscope according to claim 5, wherein said transparent member is made of a solid transparent synthetic resin.

7. A microscope according to claim 5, wherein said transparent member includes a convex lens.

8. A microscope, substantially as hereinbefore described with reference to Figs. 2 to 6.

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